

TUESDAY, AUGUST 21, 2001  
 COPPER ALLOY PATENT HARVESTING SESSION  
 GROUP 1: ROOM C-647  
 Technical Leader: Connie Wang  
 TOPIC: PROCESS

PRIORITY  
 A ☐ B ☒  
 C ☐ D ☐

## AMD INVENTION DISCLOSURE

TLD ID# 61190

Rec'd date

Sunnyvale x42110, return to M868,

Texas x55964 return to MS562

Project: ☐, Product: ☐, Process: ☐, Technology ☐, to which the invention applies (identify):

List 2 to 5 key words useful to search by to find patents or art related to this invention:

Working title of invention: Adhesion precursor layer for CVD Copper Deposition

INVENTOR/SESSION PARTICIPANT ADDRESS INFORMATION IS ON THE NEXT PAGE (A) ←

Inventor's signature: \_\_\_\_\_ date: \_\_\_\_\_  
 Inventor's printed full name: Matthews Buyrostko Citizenship: \_\_\_\_\_  
 Employee #: \_\_\_\_\_ Extension: \_\_\_\_\_ Mail stop: \_\_\_\_\_ Home telephone: ( ) \_\_\_\_\_  
 Division: \_\_\_\_\_ Directorate: \_\_\_\_\_ Dept #: \_\_\_\_\_ Dept: \_\_\_\_\_ Manager: \_\_\_\_\_  
 Residence address: \_\_\_\_\_  
 Post Office address: \_\_\_\_\_

Co-Inventor's signature: \_\_\_\_\_ date: \_\_\_\_\_  
 Co-Inventor's printed full name: \_\_\_\_\_ Citizenship: \_\_\_\_\_  
 Employee #: \_\_\_\_\_ Extension: \_\_\_\_\_ Mail stop: \_\_\_\_\_ Home telephone: ( ) \_\_\_\_\_  
 Division: \_\_\_\_\_ Directorate: \_\_\_\_\_ Dept #: \_\_\_\_\_ Dept: \_\_\_\_\_ Manager: \_\_\_\_\_  
 Residence address: \_\_\_\_\_  
 Post Office address: \_\_\_\_\_

Co-Inventor's signature: \_\_\_\_\_ date: \_\_\_\_\_  
 Co-Inventor's printed full name: \_\_\_\_\_ Citizenship: \_\_\_\_\_  
 Employee #: \_\_\_\_\_ Extension: \_\_\_\_\_ Mail stop: \_\_\_\_\_ Home telephone: ( ) \_\_\_\_\_  
 Division: \_\_\_\_\_ Directorate: \_\_\_\_\_ Dept #: \_\_\_\_\_ Dept: \_\_\_\_\_ Manager: \_\_\_\_\_  
 Residence address: \_\_\_\_\_  
 Post Office address: \_\_\_\_\_

Co-Inventor's signature: \_\_\_\_\_ date: \_\_\_\_\_  
 Co-Inventor's printed full name: \_\_\_\_\_ Citizenship: \_\_\_\_\_  
 Employee #: \_\_\_\_\_ Extension: \_\_\_\_\_ Mail stop: \_\_\_\_\_ Home telephone: ( ) \_\_\_\_\_  
 Division: \_\_\_\_\_ Directorate: \_\_\_\_\_ Dept #: \_\_\_\_\_ Dept: \_\_\_\_\_ Manager: \_\_\_\_\_  
 Residence address: \_\_\_\_\_  
 Post Office address: \_\_\_\_\_

List on additional sheet if there are more co-inventors and list total number of inventors here: \_\_\_\_\_  
 Name(s) of attorney(s) preferred by inventor(s) to prepare patent application, if known: \_\_\_\_\_

LAW FIRM: FOLEY & LARDNER  
 ATTORNEYS: Paul Hunter and Joe Ziebert

Witness 1 initial: \_\_\_\_\_ Witness 2 initial: \_\_\_\_\_

IPC CVR SHEET - gpr 1 DB 7/31/1995 gcrind Monday, August 20, 2001 3:52 PM page rev 11/25/1996

AMD CONFIDENTIAL

Page 1

Exhibit A

9/15/01  
 AM

Technical Leader: Pin-Chin Connie Wang  
Law Firm: Foley & Lardner (Paul Hunter & Joe Ziebart)

**PARTICIPANT ADDRESSES**  
Tuesday, August 21, 2001—ROOMS C-6&7

TDG-Copper Alloy Patent Harvesting Session  
Group 1 Topic: Process Issues

Name	Citizenship	Employee #	Dept. #	Mail Stop	Work #	Fax #	Address	City	State	Zip Code
Besser, Paul R. Paul.Besser@amd.com	USA	023186	07198	160	408/749-2350	408/749-5144	1087 Yorktown Drive	Sunnyvale	CA	94087
Buynoski, Matthew S. Matthew.Buynoski@amd.com	USA	022264	07016	117	408/749-4077	408/749-2953	2607 Emerson Street	Palo Alto	CA	94306
Lopatin, Sergey D. Sergey.Lopatin@amd.com	BELARUS	024895	07198	160	408/749-5175	408/749-5144	1000 Kiely Blvd #66	Santa Clara	CA	95051
Myers, Ailine F. Ailine.Myers@amd.com	USA	025301	07370	92	408/749-3928	408/774-8812	121 Saratoga Ave #4206	Santa Clara	CA	95051
Romero, Jeramias D. Jeramias.Romero@amd.com	USA	021249	07370	32	408/749-5889	408/774-8812	30077 Bridgeview Way	Hayward	CA	94544
Tran, Minh Q. Minh.Tran@amd.com	USA	024375	07198	79	408/749-3104	408/749-3851	1722 Mirabella Court	Milpitas	CA	95035
Wang, Pin-Chin Connie Connie.Wang@amd.com	TAIWAN	025191	07198	117	408/749-2887	408/749-5144	461 Burgess Drive #2	Menlo Park	CA	94025
Yu, Lu Lu.You@amd.com	PEOPLE'S REPUBLIC OF CHINA	023537	07198	160	408/749-6589	408/749-5144	5978 Friar Way	San Jose	CA	95129

**IDF PAGE 1A**

**AMD INVENTION DISCLOSURE**

TLD ID#

Rec'd date

California x42110, return to MS68.

Texas x55964 return to MS562.

Dresden x83401 Silke Kretschmar at MS E21-PP.

Identify known relevant art (patents, publications, products):

W dep. used in A metal layer/W via processes begin with a brief  $\text{SiH}_4$  WET  $\rightarrow$  WSi<sub>2</sub> deposition to c) adhere to dielectric and serve as a nucleation layer for further W deposition (from  $\text{WF}_6 + \text{H}_2$ ) with no SiH<sub>4</sub> present

State the problem solved by this invention:

Difficulty of getting Cu layers to adhere to dielectrics and of forming continuous barrier layers in ultra-narrow vias and metal lines.

Brief description and/or sketch of invention (please attach copies of AMD patent notebook pages, reports or drawings):

Forming continuous barrier/seed layers of a thickness suitable to the very small ( $< 100\text{nm}$  today and continually decreasing with each technology generation) vias and trenches of interconnect metallization, is a difficult task.

Use of CVD deposition can provide better step coverage and approximately atomic layer thickness control of deposition around.

We propose a method whereby a very thin layer ( $10\text{\AA}^2 - 100\text{\AA}^2$ ) of a suitable barrier/adhesion layer is deposited by  $\text{pHOS}$  as, then (optionally) bleached by use of 2 gases (with bearing + Cu bearing), and finally, Cu layer (with pass 3<sup>rd</sup> pass, providing an adhering agent) for the bulk layer. Such a film, deposited on a clean barrier metal can have a continuous barrier, excellent adhesion to Cu (after one pumpdown w/ bleeding if necessary), and still be thin and controllable.

Fig 1D shows the method has some flexibility. The alloy over the barrier can be turned on/off. In the example shown the barrier gas is on to form a thin layer near the top of the via, when it is expected CMP will stop - thus providing an anti-dishing harder layer. Another possibility is an alloy layer just below exposed post-CMP surface, to help prevent copper migration from Cu electroplating.

Patent notebook #

Page numbers

Number of drawings

Witness 1 initial:

Witness 2 initial:

IDPAPER011.DOC 7/31/95 printed Monday, August 20, 2001 4:09 PM page rev 6/20/00  
Page 2**AMD CONFIDENTIAL**

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**AMD INVENTION DISCLOSURE**

TLD ID# \_\_\_\_\_

Rec'd date \_\_\_\_\_

California x42110, return to MS68,

Texas x55964 return to MS562,

Dresden x89401 Silke Kretzschmar at MS R21-PP.

**Advantages (check all that apply):**

<input type="checkbox"/> avoids existing patent(s)	<input type="checkbox"/> improves precision	<input type="checkbox"/> simplifies manufacturing
<input type="checkbox"/> new function	<input type="checkbox"/> improves accuracy	<input type="checkbox"/> improves wear characteristic
<input type="checkbox"/> improves density	<input type="checkbox"/> improves efficiency	<input type="checkbox"/> improves signal to noise ratio
<input type="checkbox"/> increases operating speed	<input type="checkbox"/> fewer component parts	
<input type="checkbox"/> improves reliability	<input type="checkbox"/> reduces cost of manufacturing	

Discussion of advantage of the invention over other solutions

(emphasize technical advance in the art as measured against known art): \_\_\_\_\_

First written description* of invention, date: _____	First external disclosure to (name): _____
Date of first drawing*: _____	Date of first external disclosure, none <input type="checkbox"/>
Date invention first reduced to practice: _____	External disclosure under NDA* No <input type="checkbox"/> Yes <input type="checkbox"/>
Made by (name): _____	First external disclosure or use by: presentation <input type="checkbox"/>
Tested by (name): _____	announcement <input type="checkbox"/> , sample <input type="checkbox"/> , sale <input type="checkbox"/> , other <input type="checkbox"/>
Date of first computer simulation: _____	Date of Non-Disclosure Agreement*, if any: _____
Date of first successful test: _____	Date of first publication*: _____
any of above occurred outside of USA <input type="checkbox"/>	Publication name: _____
* attach copy if possible	Date of first commercial use: _____

Does plan exist to publish, disclose or sell? If so, where and when? \_\_\_\_\_

Was invention conceived, constructed or tested pursuant to the performance under a development contract with another company: No ☐, Yes ☐. If yes, company name \_\_\_\_\_

If yes, name of AMD business contact and contract no. \_\_\_\_\_

Was invention jointly developed with participation of inventors from outside AMD: No ☐, Yes ☐.

If yes, Company name \_\_\_\_\_

I have read and understood this disclosure and read and signed each page of the attachments:

Witness 1 signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Printed name: \_\_\_\_\_ Employee #: \_\_\_\_\_

Witness 2 signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Printed name: \_\_\_\_\_ Employee #: \_\_\_\_\_

Witness 1 initial: \_\_\_\_\_ Witness 2 initial: \_\_\_\_\_

IDFFPAPER011 DB 7/31/05 printed Monday, August 20, 2001 4:09 PM. page rev 6/20/00  
Page 3**AMD CONFIDENTIAL**

**AMD INVENTION DISCLOSURE**

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Rec'd date \_\_\_\_\_

California x42110, return to MS68.

Texas x55964 return to MS562.

Dresden x83401 Silke Kretschmar at MS B21-PP.

**DISCLOSURE EVALUATION** (Entries from this point on are by the Reviewer)Does this invention add value to the AMD intellectual property portfolio? Yes ☐, No ☐

Explain: \_\_\_\_\_

Do you know of any relevant art? Yes ☐, No ☐, If yes, attach a copy and explain: \_\_\_\_\_

What application(s) do you foresee for this invention? \_\_\_\_\_

I estimate the Value\* of this invention disclosure is A ☐, B ☐, C ☐, D ☐.

\* use worksheet "Valuing Invention Disclosures and Patents".

it is ☐, is not ☐ recommended to AMD for U.S. patent application filing,it is ☐, is not ☐ recommended to AMD for foreign patent application filing,it is ☐, is not ☐ recommended to be held as an AMD trade secret,Give this high priority ☐, normal ☐, low priority ☐, in patent application writing.**GUIDELINES AND CONSIDERATIONS FOR FOREIGN FILING DECISION**

Filing foreign patent applications is costly. We should choose to do it only when conditions warrant.

**ALL CONDITIONS BELOW MUST APPLY IN ORDER TO INITIATE A FOREIGN FILING:**

- Invention is High-Valued (A, B)\*, and
- Invention is in our technology path (usage), and
- Invention usage is detectable by inspection of product, and
- Invention is relatively hard to design around, and
- Competitor is operating in the country of interest. ( see ca000000.xls tabulation of "Factory Sites outside the USA .)

I recommend filing patent applications in foreign countries checked below:

Japan <input type="checkbox"/>	S.Korea <input type="checkbox"/>	Taiwan <input type="checkbox"/>	U.K. <input type="checkbox"/>	France <input type="checkbox"/>	Germany <input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Reviewer's signature: \_\_\_\_\_ Employee #: \_\_\_\_\_ Date: \_\_\_\_\_

Reviewer's printed name: \_\_\_\_\_

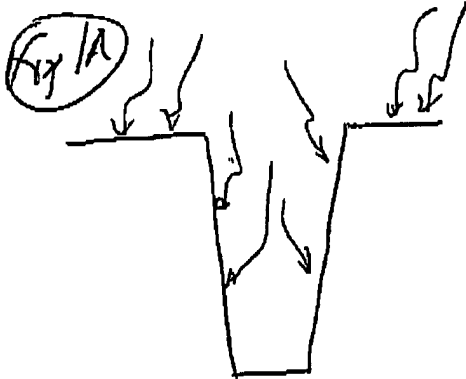
If foreign filing is checked, route to Div. VP for signature.

VP or Designate approves foreign filing (signature) \_\_\_\_\_

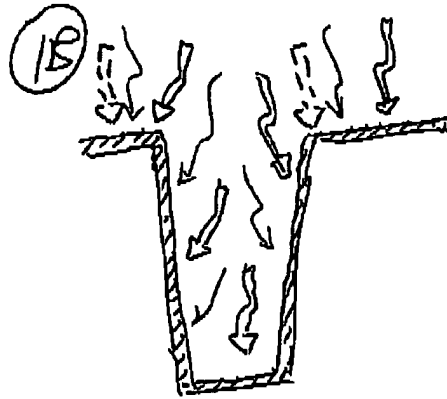
Reviewer: Completes this page and send disclosures to TLD for patent application filing.

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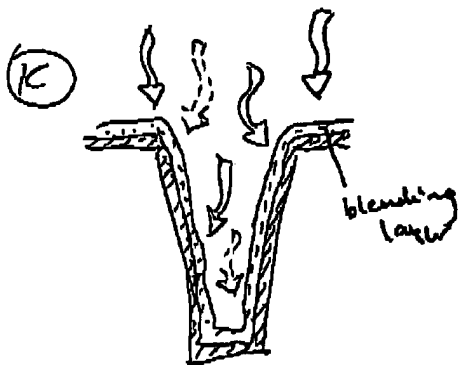
#21



1<sup>st</sup> phase - Gas #1  
depositing initial  
metal

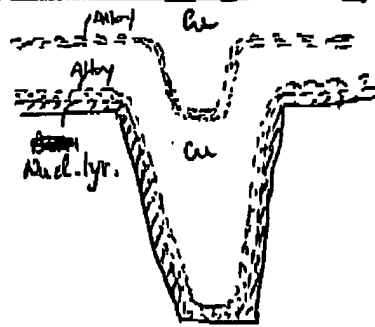


2<sup>nd</sup> phase (optional)  
Gas #1 depositing initial metal  
Gas #2 depositing Cu +  
Gas #3 depositing alloy element  
(for, eg. electromigration enhancement)



3<sup>rd</sup> phase Gas #2  
+ Gas #3 (optional)  
deposit bulk of layer.

(D)



Finished

Note it is possible to do many  
variations. Here an alloy layer  
is shown @ depth approx that expected  
after CMP

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